HULL UNIVERSITY TEACHING HOSPITALS NHS TRUST
86 - HYPERTENSION IN PREGNANCY, PRE-ECLAMPSIA AND ECLAMPSIA

Broad Recommendations / Summary
For quick reference the guide below is a summary of actions required to ensure appropriate implementation of this policy / procedure / guideline. This does not negate the need for the document author and others involved in the process to be aware of and follow the detail of this policy / procedure / guideline.

1 BACKGROUND

Hypertensive disorders during pregnancy carry risks for the woman and the baby and is one of the leading causes of maternal death in the UK. In the last annual report from MBRRACE-UK (Dec 2019) 5 maternal deaths were the result of eclampsia or pre-eclampsia. The risks to the baby are higher rates of perinatal mortality, preterm labour and low birth weight.

Most hypertensive disorders that occur during pregnancy develop for the first time in the second half of pregnancy. New hypertension can occur without significant proteinuria (gestational hypertension) or with significant proteinuria (pre-eclampsia). Hypertensive disorders can occur in women with chronic hypertension (pre-existing hypertension) (NICE 2019).

Pre-eclampsia is a multi-systemic disorder unique to pregnancy which is usually associated with hypertension and proteinuria. It rarely presents before 20 weeks.

Eclampsia: One or more generalised seizures in association with pre-eclampsia. It can occur even if the blood pressure is normal.

Gestational hypertension (previously Pregnancy Induced Hypertension) a new onset of raised blood pressure after 20weeks of pregnancy, without maternal or fetal signs of pre-eclampsia

Pre-existing hypertension (chronic hypertension) present at booking or before 20 weeks. Can be primary or secondary aetiology.

Degrees of Hypertension

Mild	Diastolic blood pressure	**90-99mmHg**,	systolic blood pressure	**140-149mmHg**
Moderate	Diastolic blood pressure	**100-109mmHg**,	systolic blood pressure	**150-159mmHg**
Severe	Diastolic blood pressure	**≥110mmHg**,	systolic blood pressure	**≥160mmHg**

This guideline applies to all midwives and medical staff employed by the Hull University Teaching Hospitals NHS Trust who care for women with hypertension in pregnancy, pre-eclampsia and eclampsia

2 POLICY / PROCEDURE / GUIDELINE DETAILS

SEVERE PRE-ECLAMPSIA AND ECLAMPSIA

Risks Factors

Some women are more at risk of developing pre-eclampsia, NICE guideline (CG107) categorises these into moderate and high risks and advises women with two or more moderate risks and one high risk to be commenced on aspirin 150 mg daily as soon as possible from the risk being identified until delivery.

At Hull University Teaching Hospitals NHS Trust list of women deemed high risk has been expanded to include:

- ☐ Hypertensive disease during previous pregnancy
- ☐ Chronic kidney disease
- ☐ Autoimmune disease such as systemic lupus erythematous or antiphospholipid syndrome
- ☐ Type 1 or Type 2 diabetes
- ☐ Chronic hypertension
- ☐ Low PAPP-A screening blood test
- ☐ Previous IUGR (either birth weight <2.5kg or <10th centile)
- ☐ Previous stillbirth
- ☐ Previous pre-eclampsia/eclampsia

Women who fall into this category should be advised to commence aspirin 150mg daily at the earliest opportunity, aiming to reduce the risk associated with increasing complexities in pregnancy.

Other women who have 2 or more of the moderate risk factors below should also be advised to commence 150mg of aspirin daily:

- ☐ First pregnancy
- ☐ Pregnancy interval of more than 10 years
- ☐ Family history of pre-eclampsia
- ☐ IVF pregnancy
- ☐ Body mass index(BMI) $\geq$ 35 at booking/first visit
- ☐ Multiple pregnancy
- ☐ Age 40 years or older

Women will usually be identified as having a risk factor at the booking appointment; the community midwife will then send a letter to the GP advising the prescription of aspirin (see appendix 2). When PAPP-A results are screened in the Antenatal Clinic, the midwife will send the letter to GP if a low result is identified. When women are seen in the Antenatal Clinic immediately following confirmation of a multiple pregnancy, the midwife will send the letter to the GP. If previous birth weight <10th centile is identified at the production of the customised growth chart, the woman's details will be sent to ANC for the ANC midwife to send the letter to the GP.

Importance of attending antenatal reviews to monitor for hypertension disorders will be discussed by the community midwife. See Appendix 2 for GP referral letter.

* Epigastric pain, vomiting, headache, visual disturbances, reduced fetal movements, small for gestational age fetus

ASSESSMENT AND DIAGNOSIS OF PRE-ECLAMPSIA, AND GESTATIONAL HYPERTENSION

Assessment by Community Midwives or GP

During any appointment or presentation at the GP or with a community midwife with a gestation greater than 16 weeks the following assessment and action is required:

Blood Pressure	Proteinuria / Symptoms	Investigation	Management/Treatment
Systolic ≥150 Diastolic ≥100	+ or - Proteinuria or *Symptoms	→	Refer to ADU same day
No hypertension	> 1+ Proteinuria and Symptoms	→	Refer to ADU same day
No hypertension	2+ Proteinuria No Symptoms	MSU & PCR	Refer to ADU within 24hrs
No hypertension	1+ Proteinuria No Symptoms	MSU & PCR	CMW see once weekly *
Systolic 140-149 Diastolic 90-99	No Proteinuria and No Symptoms	→	Refer to ADU within 24hrs
Systolic 140-149 Diastolic 90-99	≥1+Proteinuria	→	Refer to ADU same day

*For women in labour, in the absence of hypertension & if asymptomatic, send a PCR only if 2+proteinurea or greater.

If less than 16 weeks and the BP is uncontrollable following a GP review. Refer to the multidisciplinary team (MOT team).

Criteria for Antenatal Day Unit Assessment and Management
During any appointment or presentation at the Antenatal Day Unit the following assessment and action is required:

<table>
<tr><th>Blood Pressure after x 3 BP</th><th>Proteinuria/ Symptoms</th><th>Investigation</th><th colspan="2">Management/Treatment</th></tr>
<tr><td>>150
>100</td><td>+ or -
Proteinuria or
Symptoms</td><td rowspan="4">⇨
• FBC
• BCP
• MSSU
• PCR
• <37 weeks Liquor Volume & Doppler
• Growth Scan</td><td colspan="2" rowspan="2">Medical review- Treatment with Labetalol and admit</td></tr>
<tr><td>140-149
90-99</td><td>>1+ Proteinuria
or
Symptoms</td></tr>
<tr><td rowspan="2">140-149
90-99</td><td rowspan="2">≤1+ Proteinuria

Not symptomatic</td><td>Abnormal results</td><td>SpR review- consider Treatment with Labetalol</td></tr>
<tr><td>Normal Results</td><td>MW's Discharge home x 1 weekly review BCP & FBC with primary care and or CMW</td></tr>
<tr><td></td><td>No Proteinuria</td><td>⇨</td><td></td><td>MW's Discharge home x 1 weekly review with</td></tr>
</table>

140-149 **90-99**	and **No Symptoms**	⇨ • BCP • FBC	**Normal Results**	primary care and or CMW
			Abnormal Results	Discuss with on call SpR

Assessment of proteinuria in pre-eclampsia

- **1+ protein and above on dipstick - send MSU with request for Culture and Sensitivity and Urinary Protein Creatinine Ratio PCR**
- **A definitive diagnosis of pre-eclampsia is made if there is new hypertension presenting after 20weeks with significant proteinuria and <u>Urinary Protein Creatinine Ratio (PCR) > 30 mg/mmol</u>**

Once significant proteinuria diagnosed no need to repeat PCR , just monitor renal function with BCP (creatinine, potassium, albumin) however if the result is <u>></u>30 and there is still uncertainty about the diagnosis of pre-eclampsia, consider re-testing on a new sample, alongside clinical review.

The 1st morning void should not be used to test for proteinurea

As part of all antenatal reviews, the midwife/obstetrician will assess for pre-eclampsia.

As part of the assessment where **pre-eclampsia** is suspected **basic blood investigations** are undertaken by obtaining a Full Blood Count (FBC) and a Biochemical Profile (BCP) which will include kidney function, full blood count, electrolytes, transaminases, bilirubin (NICE 2019). The frequency of blood investigations are in relation to the defined blood pressure recording as follows:-

Management of Pregnancy with Pre-eclampsia
(which is usually associated with hypertension and proteinuria).

Degree of Hypertension	**Moderate** hypertension **150/100** to **159/109**mmHg	**Severe** hypertension **160/110**mmHg **or higher**
Admit	**Yes**	**Yes** Consider direct admission to labour ward after review
Treat	With oral labetalol to keep Systolic BP less than 150mmHg Diastolic BP between 80-100mmHg (Labetalol should not be omitted unless a medical review has taken place or there is a documented plan with BP threshold to omit)	With oral labetalol to keep Systolic BP less than 150mmHg Diastolic BP between 80-100mmHg (Labetalol should not be omitted unless a medical review has taken place or there is a documented plan with BP threshold to omit)
Measure Blood Pressure	At least four times a day whilst inpatient. Every 48 hours whilst outpatient.	Minimum of six times a day. Every 15-30 minutes if >160/110. Consider commencing the protocol

Test for Proteinuria	Do not repeat quantification of Proteinuria	Do not repeat quantification of Proteinuria
Blood tests	Monitor twice weekly BCP, FBC	Monitor x 3 weekly BCP, FBC unless on the Critical Care pathway
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment. Perform a CTG at diagnosis and repeat if clinically indicated. Ultrasound assessment at diagnosis, if normal repeat every 2 weeks.	Offer fetal heart auscultation at every antenatal appointment. Perform a CTG at diagnosis and repeat if clinically indicated. Ultrasound assessment at diagnosis, if normal repeat every 2 weeks.

A diagnosis of pre-eclampsia will be ascertained by the results of the above assessment. All results will be recorded on the results flow chart within the woman's maternity hospital records unless on the Critical Care Pathway where they will be recorded on the Intensive Care Protocol document.

Severe pre-eclampsia is identified by severe hypertension with proteinuria or mild or moderate hypertension with proteinuria with at least one of the following:

- **Severe headache**
- **Problems with vision such as blurring or flashing**
- **Severe pain just below ribs or vomiting**
- **Vaginal bleeding**
- **Papilloedema**
- **Signs of clonus (≥ 3 beats)**
- **Liver tenderness**
- **HELLP syndrome**
- **Platelet count falls to < 100 x 109/llitre**
- **Abnormal liver enzymes (ALT or AST rises to > 70iu/litre)**

Consider MgSo4 treatment using the above features

Assessment and Diagnosis of Eclampsia

All seizures in pregnancy/pueperium are to be treated as Eclampsia until proven otherwise. Further assessments to ensure accurate diagnosis would be basic blood investigations and clinical assessment as required for pre-eclampsia.

COMMUNICATION BETWEEN PROFESSIONALS- A multi-disciplinary approach
Pre-eclampsia
Where a woman has severe pre-eclampsia the midwife caring for the woman will inform the labour ward coordinator who will liaise with the Obstetric Registrar.

The Obstetric Registrar will assess the woman and decide if commencement of the Critical Care Pathway is required.

The Obstetric Registrar or an allocated member of the team will contact the Consultant Obstetrician and the Consultant Anaesthetist to discuss commencement of the Critical Care Pathway

Where delivery is required the Registrar / Obstetric Consultant will contact the on call Paediatrician to discuss optimum timing of the delivery to improve best possible outcome

Documentation of these discussions will be in the Intensive Care Protocol document or antenatal care plan.

Eclampsia
The communication plan to be followed for eclampsia is detailed at Appendix 4.

Management of Pregnancy with Gestational Hypertension
(a new onset of raised blood pressure without maternal or fetal signs of pre-eclampsia)

Degree of Hypertension	**Moderate** hypertension 140/90mmHg to 159/109mmHg	**Severe** hypertension (160/110mmHg or higher) Inpatient
Admit	**No**	**Yes** (until blood pressure is 159/109mmHg or lower)
Treat	With oral labetalol if BP remains above 140/90mmHg (Labetalol should not be omitted unless a medical review has taken place or there is a documented plan with BP threshold to omit)	With oral labetalol (Labetalol should not be omitted unless a medical review has taken place or there is a documented plan with BP threshold to omit)
Measure Blood Pressure	At least twice a week	Every 15-30 minutes until BP is less than 160/110 mmHg
Test for Proteinuria	At each visit using ideally an automated reading device Send PCR if Proteinuria present	Daily using automated reagent-strip reading device. Send PCR if Proteinuria present
Blood Tests	Test kidney function, BCP, FBC **Do not** carry out further blood tests if no proteinuria at subsequent visits	Test at presentation and then monitor weekly: BCP, FBC
Fetal assessment	Offer fetal heart auscultation at every antenatal appointment. Perform a CTG at diagnosis and repeat if clinically indicated. Ultrasound assessment at diagnosis, if normal repeat every 2-4 weeks.	Offer fetal heart auscultation at every antenatal appointment. Perform a CTG at diagnosis and repeat if clinically indicated. Ultrasound assessment at diagnosis, if normal repeat every 2 weeks if severe hypertension persists.

Critical Care Pathway of severe Pre-eclampsia & Eclampsia

Eclampsia
All seizures in pregnancy/pueperium are to be treated as Eclampsia until proven otherwise

Severe Pre-eclampsia without severe Hypertension
Discuss with on call consultant

Severe Pre-eclampsia with Severe Hypertension

- Commence oral Labetolol 200mgs (May consider IV)
- Repeated after 30 minutes if no response**.** Discuss with on call consultant

Maintain Safety
Assessment: ABC
(Airway, Breathing, Circulation)
Left lateral tilt
O_2 15litres/min
Consider nasopharageal airway
Obtain Emergency trolley

Follow agreed plan of care

Tel 2222 declare an Obstetric Emergency stating location

Ask to speak to Consultant Obstetrician

Commence severe Pre-Eclampsia/Eclampsia Intensive Care Protocol Document

Immediate Care

1. IV access x2 16g cannula
2. Bloods taken for: BCP, FBC, Clotting, Group and save serum
3. 20mls Magnesium Sulphate 20% IV (Run at 200mls/hr via syringe pump) = 4g Loading dose (*draw up 25mls then prim the line. set VTBI to 20mls this will ensure the full 20mls does is achieved*)
4. Recurrent seizures should be treated with further does of 2-4gm of MgSO4 given over 5mins
5. Monitor BP and oxygen Saturation
6. If BP elevated commence IV Labetolol 50mgs over 1 minute (Concentration 5 mg/1 ml)**.**
7. Repeat BP every 5mins followed by repeat dose of Labetolol up to 200mgs/(20mins) unless Blood Pressure is <150/100 **8**. **Diazepam** 5-10mgs if *in status epilepticus*
9. Once stable transfer to Labour Ward using the Obstetric team

Maintenance Care

50mls Magnesium sulphate 20% I.V. over 24 hours (run at 5mls/hr via syringe pump) =1g/hr maintenance dose
Catheterise measure and test hourly
If BP is still not controlled after 4 stat does IV of Labetalol given every 5mins
Continue with I.V. labetalol infusion (5 mg/ml) at 4 ml/hr via syringe pump. Double dose ½ hourly until satisfactory B.P. response up to Maximum 32mls/ hour (160mg/hr) **if still not controlled consider Nifedipine**
Total I.V input limited to 80 ml/hr total via volumetric pump (Ideally patient to be Nil by Mouth and Total input 80ml/hr)
Compression stockings and **boots** to be applied
Fetal monitoring applied if required
Team discussion to Consider delivery commence steroids if <36weeks

Inpatient Management – Antenatal, Labour and Postnatal Wards

Monitoring on the Antenatal / Postnatal Ward- Mild to Moderate Pre-Eclampsia

- **BP/Pulse 15-minute intervals until stabilised/reviewed on the ANC, then 4 times a day unless scoring red on the MEOWS chart**
- Initially check BP manually with the **CORRECT SIZE CUFF** on both arms and act on higher reading, compare to automated readings, (as there can be a difference between the two, when using an automated machine ensure this is documented and trends noted)
- Urinalysis daily
- **Bloods** if not taken in the ANC - **Full blood count, Biochemical Profile, Group and save, Clotting**(PT, KCCT + fibrinogen, FDP`s) only if platelets <100,
- **Fetal Well-being –** CTG, Doppler, liquor volume, Growth as clinically indicated
- **Daily obstetric review Inc. Deep Tendon reflexes,**
- **Accurate fluid Balance totalled daily**

All results will be recorded on the results flowchart within the woman's maternity hospital records. Abnormal results/findings to be discussed with the on call SpR/Consultant

Monitoring on the Labour Ward – severe pre-eclampsia

- **Temperature** 4 hourly
- **Continuous pulse oximetry** recorded hourly (If less than 95% ® medical review).
- **BP/Pulse 15-minute intervals for a minimum of 4 hours until stabilised then every 30 minutes**. Initially check BP as above
- **Respiration rate** 1 hourly.
- **Indwelling catheter** -urine measured hourly.
- **Accurate input** (includes all IV fluids and drug diluent)
- **C.V.P**. if sited measured continuously and charted every hour
- **Fetal well-being and CTG**. (Liquor Volume + Doppler=Growth as indicated)

This will be documented on the Intensive Care Chart

Monitoring specific to Magnesium Sulphate* Infusion

This infusion requires intensive care and the following close observations to prevent Magnesium Sulphate Toxicity :-

Every 4 hours and prior to starting a new syringe the following observations should be made:
General review by the Obstetric staff including

- Reflexes are present (Biceps if epidural working)
- Respiration rate is more than 12/min.
- Urine output is more than 80mls in previous 4 hours. (Beware of pulmonary oedema)

Observations

- Continuous pulse oximetry SaO2 >95%
- Urine output is more than 80mls in previous 4 hours.
- Deep tendon reflexes, after the first hour, then 4 hourly (Biceps if epidural in situ) and before each syringe is changed. There should be no great change from the original reflexes.

- **If the above criteria are not met then further administration of magnesium sulphate should be discussed with senior Obstetrician.**

- **Hourly respiratory rate <12 To stop infusion, call for Urgent Senior Obstetric review**

The Antidote to Magnesium Sulphate Toxicity is 10ml 10% calcium gluconate given slowly intravenously over 3-5minutes

97% of magnesium is excreted in the urine and therefore the presence of oliguria can lead to toxic levels. If the above criteria are not met then further administration of magnesium sulphate should be withheld. Magnesium should be re-introduced if urine output improves.

Side Effects:- Motor paralysis, absent tendon reflexes, respiratory depression and cardiac arrhythmia (increased conduction time), respiratory/cardiac arrest, can all occur but will be at a minimum if Magnesium is administered slowly and the patient observed as above.

THERE IS NO NEED TO MEASURE MAGNESIUM LEVELS WITH THE ABOVE

To be recorded on the Intensive Care Chart

* The medical staff are responsible for the assessment of the women and the decision to commence and discontinue magnesium sulphate administration.

Prevention of Eclamptic seizures using Magnesium Sulphate on Pre-Eclampsia/Eclampsia Intensive Care Protocol:

- Discussion between Consultant Obstetrician and Consultant Anaesthetist may elect for preventative therapy.
- Magnesium sulphate (MgSO4) Protocol-pre diluted 20% vials
- Magnesium sulphate is given as a loading dose followed by a continuous infusion for 24 hours or until 24 hours after delivery - whichever is the later.
- Each syringe should last 10 hours. This regime administers 1g/hour
- Monitoring on the Labour Ward see point 5.5
- Fetal well-being and CTG. (Biophysical + Doppler as indicated) referring to the Hull University Teaching Hospitals NHS Trust guideline for intrapartum assessment of fetal wellbeing available at: http://intranet/guidelines/guidelines/180.pdf

Management of Recurrent Seizures

- Consider repeating the loading dose of Magnesium Sulphate
- Increase infusion of magnesium sulphate to 1.5 g/hr.
- Continue observations and consider the need for ventilation. (If the woman is known to have epileptic fits, refer to guideline, The management of pregnancy in women with epilepsy, available at: http://intranet/guidelines/guidelines/155.pdf
- IV Diazepam 5-10mgs slowly

Blood Pressure Control

The following flowchart on page 10 describes the procedure for management and treatment of blood pressure.

Blood Pressure Control (BP)

Note. BP ≥ 150/100mmHg requires prompt medical treatment

Eclampsia

Pre-eclampsia

NO Pre-eclampsia

Labetalol 200 mgs orally (Where Labetolol is contraindicated see **NB** below)

Repeat Labetalol 200mgs orally after 30 minutes If no response Inform the Consultant Obstetrician on duty after a further 30 minutes

If BP elevated/unresponsive transfer to labour ward and commence **Intensive Care Chart (Option 2 for hypertension)**

Commence IV Labetalol **bolus** 50mgs (concentration 5mgs/1ml) over 1 minute

If **NO response with in 5min repeat up to a max of 200mgs**

Commence a IV infusion of Labetalol (5mg /ml) at 4ml/hr via syringe pump.

Double the dose every ½ hourly until Maximum of 32mls /hour (160mg/hr.)

If Antenatal continuous CTG monitoring >26weeks during IV Labetalol infusion

Responsive **Responsive** **Unresponsive**

Once Blood pressure has reduced and stabilised for 2 hours.

Once complete, commence oral antihypertensive and discontinue ICU chart

Blood pressure to be taken 4 times a day whist in hospital and daily urinalysis as a minimum

If still no response**, OPTION 1** consider **SECOND LINE** antihypertensive, **Nifedipine IR 10mgs** orally (if IR not available, crush MR for immediate release effect) or **OPTION 2** commence IV Labetalol

Commence CTG monitoring

OPTION 1

BP should be taken every 10mins in the first ½hr after treatment as there can be a marked drop in BP following Nifedipine

OPTION 1

If unresponsive follow flow chart for IV Labetolol

Reduction in blood pressure to ≤140/90

Consider an oral maintenance

Blood pressure to be taken 4 times a day whilst in hospital and daily urinalysis

If responsive it should be repeated 6hrly.

Postnatally then changed to a slow release tablet which last 12 hourly

If 2 antihypertensive required to control BP. Consultant review required within 24 hours

NB If Labetalol fails to control BP once the maximum dose achieved **OR** if labetolol is contraindicated the Second Choice is Nifedipine 10mgs orally as above *(**not** slow or modified release. If IR not available, crush MR to get immediate release effect)*

Blood Pressure control of pre-eclampsia / eclampsia, gestational hypertension / pre-existing hypertension is to treat hypertension (and especially systolic hypertension) quickly and effectively

NOTE. BP ≥ 150/100mmHg requires prompt medical treatment

As a guide with Pre-eclampsia/ Eclampsia in the Antepartum / Intrapartum period Management for stabilization of BP is to reduce diastolic BP by 10mmHg in the first instance and maintain the blood pressure between 130/80 and 140/90

Blood pressure to be monitored 4 times a day whilst in hospital and daily urinalysis as a minimum

Fluid Balance for Pre-Eclampsia and Eclampsia

Careful fluid balance is aimed at avoiding fluid overload. The procedure for avoiding fluid overload antenatally is the following:

- Total IV input limited to 80 ml/hr total. Includes oral if they must be given.
- If syntocinon is used it should be at high concentration and the volume of fluid included in the total input.
- Oliguria - no action except encourage early delivery.
- Oral fluids should be limited.

Postnatal woman should be fluid restricted in order to wait for the natural diuresis which occurs sometime around 36-48 hours post-delivery.

- Total of 80mls of IV and oral every hour, for the duration of Mg So4.
- IV maintenance can be withdrawn as soon as the patient (condition has stabilised) and is able to drink, maintaining 80ml per hour of oral fluids until Mg So4 has finished.
- Increased oral fluid intake beyond 80ml/hr can be considered at the discretion of the consultant in the presence of diuresis.
- Urine output hourly - Each four-hour block should be totalled and charted. Aim for at least 80 ml in 4 hours (refer to YOCCG 24 hour high dependency chart).

If 2 x 4 hour blocks less than 80 mls each then there are two possible courses of action:

Action 1 – If the total INPUT LESS than TOTAL (output +750mls) the following action to be taken:

- Px Volplex 250 mls. over 20 minutes.
- Watch output over 4 hours
- If less than 80 mls px 20 mgs I.V. furosemide
- If greater than 250 mls in 1 hour after the Frusemide, then give extra 250 mls Volplex on top of baseline fluids

Action 2 – If the total INPUT GREATER than Total (OUTPUT + 750mls) the following action to be taken:

- Px IV Frusemide 20mgs
- Watch output over the next 4 hours
- If greater than 250ml in 1 hour after the Frusemide then give extra 250mls of Volplex on top of the baseline fluids

See Appendix 5 for examples.

Points to consider for management

- Persisting oliguria requiring fluid challenge or furosemide requires the electrolytes to be assessed and checked six-hourly.
- Concern over a rising creatinine and or potassium will be discussed with a Consultant.
- Reduction in oxygen saturation is most likely due to fluid overload. Input and output should be assessed together with either clinical or invasive assessment of the fluid balance. The most appropriate treatment is likely to be furosemide and oxygen.
- If no diuresis and the oxygen saturation does not increase referral to the medical renal team will be considered.
- Large volumes of colloid such as fresh frozen plasma, blood or platelets can lead to fluid overload.
- Significant haemorrhage or HELLP will be managed by a Consultant Obstetrician and Anaesthetist

Thromboprophylaxis

All women should have compression stockings and boots whilst **immobile**, in the antenatal, Intrapartum and postnatal period if a Low Molecular Weight Heparin (LMWH) is not prescribed.

If a (LMWH) is to be given with an epidural or spinal already in-situ, discuss with anaesthetist on call. The same consideration is to be given after spinal or general anaesthesia (Ref guideline for Thromboprophylaxsis) http://intranet/guidelines/guidelines/111.pdf Any woman on LMWH in the Antenatal period cannot have regional analgesia 12 hour from the last does of prophylactic heparin, or 24 hours from the last does of therapeutic LMWH.

AN EPIDURAL CATHETER SHOULD BE LEFT IN PLACE UNTIL 12 HOURS AFTER LOW MOLECULAR WEIGHT HEPARIN HAS BEEN GIVEN

In the case of severe pre-eclampsia where the platelet levels are less than 50-109/l and coagulation screen abnormal;

- Increase D Dimer
- Fibrinogen below 2g unit
- PT and APPT abnormal

Prophylactic thromboprophylaxis should be provided with compression stockings and compression boots. DALTEPARIN SHOULD BE WITHHELD

The coagulation screen including FBC/PT/APTT should be assessed on a daily basis and once the platelets are stable above 50 with PT and APTT within normal limits and fibrinogen more than 2g prophylactic Dalteparin can be initiated.

Fetal assessment and delivery planning

During the assessment for pre-eclampsia and eclampsia an assessment of the fetus will also take place via ultrasound and/or CTG monitoring where gestation is over 26 weeks. If results of any fetal monitoring abnormal the consultant obstetrician will be informed.

Delivery planning will be as follows:

- If the pregnancy can be prolonged in excess of 48 hours, steroids help mature the fetal lungs.
- Delivery is not necessarily by caesarean section but if gestation is under 32 weeks it is preferable. After 34 weeks vaginal delivery should be considered in a cephalic presentation.

- Delivery timing will be facilitated by Consultant level discussion between Obstetrician, Paediatrician and Anaesthetist.
- Consultant Obstetric staff should document in maternal notes (biochemical, haematological and clinical) and fetal thresholds for elective birth before 34 weeks in women with pre eclampsia (In accordance with NICE cg107- 1.5.2.2)
- Consultants should write a plan for antenatal fetal monitoring in all patients with Pre eclampsia. (In accordance with NICE cg 107,1.5.2.3)
- The mode of delivery should be discussed with the Consultant Obstetrician.

Timing of Birth

Pre-eclampsia

- Recommend birth for women who have pre-eclampsia with severe hypertension after 34 weeks when their blood pressure has been controlled and a course of corticosteroids has been completed (if appropriate).
- Offer birth to women who have pre-eclampsia with mild or moderate hypertension at 34^{+0} to 36^{+6} weeks depending on maternal and fetal condition, risk factors and availability of neonatal intensive care.
- Recommend birth within 24–48 hours for women who have pre-eclampsia with mild or moderate hypertension after 37^{+0} weeks.

Gestational Hypertension

- Do not offer birth before 37weeks
- After 37 weeks, timing of and maternal and fetal indicators for birth should be agreed between the woman and senior Obstetrician.
- In refractory severe gestational hypertension , offer birth after course of corticosteroids (if required) is completed

Chronic Hypertension

- Do not offer birth to women with chronic hypertension whose blood pressure is lower than 160/110 mmHg, with or without antihypertensive treatment, before 37 weeks.
- For women with chronic hypertension whose blood pressure is lower than 160/110 mmHg after 37 weeks, with or without antihypertensive treatment, timing of birth and maternal and fetal indications for birth should be agreed between the woman and the senior obstetrician.
- Offer birth to women with refractory severe chronic hypertension, after a course of corticosteroids (if required) has been completed.

NB when a women is eclamptic a clinical decision may be made that will require delivery at an earlier opportunity.

Vaginal Delivery

- Vaginal prostaglandins will increase the chance of success.
- Anti-hypertensive treatment will be continued throughout assessment and labour.
- If vaginal delivery is planned then the second stage should be short with consideration given to elective operative vaginal delivery.
- An epidural is recommended

The third stage should be managed with 5 units of I.V. SYNTOCINON NOT Ergometrine or Syntometrine in any form.

Stabilisation of the woman before transfer

- If a decision to deliver at another hospital, the Consultant Obstetrician will discuss and agree transfer with the Consultant Obstetrician at the receiving hospital
- Follow the guideline for transferring a woman to another unit Ref guidelines for transfer in to the Women & Children's Hospital http://intranet/guidelines/guidelines/128.pdf

Postnatal Management

Prior to discharge.

- **All cases admitted with pre-eclampsia to be reviewed by consultant/senior Obstetrician within and every 24hrs for further management, or discharge planning**
- BP to be routinely monitored or more frequently as clinically indicated until discharge.
- BP to be recorded on day of discharge.
- Antihypertensive medication to continue unless diastolic ≤ 80mmHg (as BP likely to rise again at 48 to 72 hours postnatal).

On discharge

Discharge requires a senior obstetric review, care will not be transferred to midwifery led.
Take home antihypertensive medication will be given unless diastolic ≤ 80mmHg.

Blood Pressure	Blood results	Obstetric discharge management
<150/100	Normal	1. Discharge completed 2. Take-home antihypertensive medication given
≥150/100	1. Abnormal with an improving trend & 2. Asymptomatic	Discuss with SpR/Con re-discharge and antihypertensive take home medication
≥150/100	1. Abnormal remaining stable or deteriorating. 2. Symptomatic	For SpR/Con review Continue antihypertensive

5.12 Postnatal Follow-up

In all cases of severe pre-eclampsia or eclampsia and individualised follow-up plan will be communicated to the GP.

3 REFERENCES

- NICE Guideline: Hypertension in Pregnancy: Diagnosis and management, 2019 https://www.nice.org.uk/guidance/ng133
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4 APPENDICES

Appendix 1 – Monitoring Overview
Appendix 2 – Referral to GP
Appendix 3 – Guidelines for Anaesthetists
Appendix 4 – Lines of communication
Appendix 5 – Fluid balance

Document Control			
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Email distribution to all midwifery, obstetric and anaesthetic staff. Discussion and approval at obstetric guidelines meeting, obstetric governance meeting and health group governance meeting.			
Key words (to aid intranet searching)			
PET, pre-eclampsia, eclampsia, labetalol, hypertension, proteinurea, blood pressure			
Target Audience			
All staff	Clinical Staff Only	Non-Clinical Staff Only	
Managers	Nursing Staff Only	Medical Staff Only	

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Date	**Version**	**Author**	**Revision description**
August 2012	V2	Sue Sallis	Minor Template Changes and update
November 2012	V3	Sue Sallis	Changes to section 5
November 2013	V4	Sue Sallis	Changes and update
May 2014	V4.1	Obstetric Guidelines Group	Amendment to monitoring form – frequency of audit
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		Miss Jaishree Hingorani	
June 2018	V5.1	Stephen Boakye	Update to reflect changes in aspirin criteria
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September 2019	V6.1	Jennifer Moverley	Amendments to reflect recent NICE guidance
November 2019	V6.2	Jennifer Moverley Ann Kristensen	Amendment to process if Niefedipine IR not available & omitting labetalol
April 2020	V6.3	Jayne Gregory	Risks amended and aspirin prescription for SBLV2

Appendix 1 - DUTIES

The following section details staff duties and responsibilities for the implementation of this guideline. The following list is a guide only and is not exhaustive:

Title	Duties
Obstetric Consultant	• Clinical lead for the management of women with hypertension, pre-eclampsia/eclampsia throughout pregnancy and birth • Develops a management care plan which is documented in the woman's hospital maternity records and/or the handheld records • Attend in person in the event of the clinical situation of eclampsia
Obstetric Registrar	• Supports the Consultant Obstetrician with the woman's management plan • Is the lead for each maternity episode in the absence of the Consultant Obstetrician
Senior House Officer	• Provides medical review of women presenting with hypertension and pre-eclampsia • Refers to the Obstetric Registrar to discuss the woman's management plan
Consultant Anaesthetist	Will be available to assist at the request of obstetric and midwifery staff
Labour Ward Coordinator	Responsible to coordinate the management and communication between the multidisciplinary team
Midwife	• Refers to a Consultant Obstetrician all woman identified in the antenatal period with a hypertension disorder • Refers to a Consultant Obstetrician/Obstetric Registrar if women present with a hypertension disorder in labour • Coordinates and supports the woman with a multidisciplinary care plan including communication and documentation of discussions in the maternity hospital or/and the woman's handheld records
Porters	Responsible for the expedited collection and delivery of blood samples for biochemistry, and assist with the transfer of the woman on a bed/trolley and the equipment to HDU / ICU.
Identified Scribe	Responsible for documenting all events and management decisions as they occur in cases of eclampsia.

APPENDIX 2

REFERRAL TO GP FOLLOWING IDENTIFICATION OF RISK FACTORS

RE:

Addressograph

DATE

Dear Dr

The above patient of yours has booked for her antenatal care. She has an increased risk of developing pre-eclampsia in this pregnancy as she has:

One of the following high risk factors

(please tick)

- ☐ Hypertensive disease during previous pregnancy
- ☐ Chronic kidney disease
- ☐ Autoimmune disease such as systemic lupus erythematous or antiphospholipid syndrome
- ☐ Type 1 or Type 2 diabetes
- ☐ Chronic hypertension
- ☐ Low PAPP-A screening blood test
- ☐ IUGR in previous pregnancy (Less than 2.5kg birth weight or below 10th centile)
- ☐ Previous stillbirth
- ☐ Pre-eclampsia in previous pregnancy

Two or more of the following moderate risk factors:

- ☐ First pregnancy
- ☐ Pregnancy interval of more than 10 years
- ☐ Family history of pre-eclampsia
- ☐ IVF pregnancy
- ☐ BMI $\geq$ 35 at booking
- ☐ Multiple pregnancy (Please also prescribe ferrous sulphate 200mg BD & folic acid 400mcg OD if normal BMI or 5mg OD if BMI more than 30)
- ☐ Age 40 years or older

The Hull University Teaching Hospitals NHS Trust guideline – Hypertension in pregnancy recommends **Aspirin 150 mgs** daily at the earliest opportunity **when the risk factor is identified until the birth of the baby** to reduce the risk of developing pre-eclampsia.

I should be grateful if you could kindly consider an Aspirin prescription for this patient, subject to the usual contraindications.

Thank you
Midwife

APPENDIX 3

GUIDELINES FOR ANAESTHETISTS

Analgesia for Labour

Consultant anaesthetist should be informed as soon as woman is commenced on the pre-eclampsia pathway.

Regional Anaesthesia is the preferred method of analgesia. However consultant advice is required if:

- Platelet count under 80 x 109/l
- Abnormal clotting (PTT or TT)

Opiate infusion or PCAS would need to be considered if epidural was contra-indicated.

Anaesthesia for caesarean section

- Epidural anaesthesia is the preferred method of anaesthesia if already in situ.
- Spinal anaesthesia should be used if no epidural in place or if epidural in labour has failed.
- General anaesthesia should only be used if regional block is impossible or contraindicated.

Management of General Anaesthesia

General anaesthesia can add to the risks of delivery since intubation and extubation can lead to increases in systolic and diastolic blood pressure, as well as heart rate, so should be avoided where possible.

In addition to standard procedures, alfentanil 2 mgm. and labetolol 15 mgm. should be given prior to intubation to obtund hypertensive reflexes.

DO NOT give a non-depolarising muscle relaxant until there is evidence or recovery from suxamethonium. Give only small doses of atracurium thereafter - for example, 5-10 mgm, with nerve stimulator control, if available, since the effect of muscle relaxants is usually prolonged in the presence of therapeutic levels of magnesium sulphate.

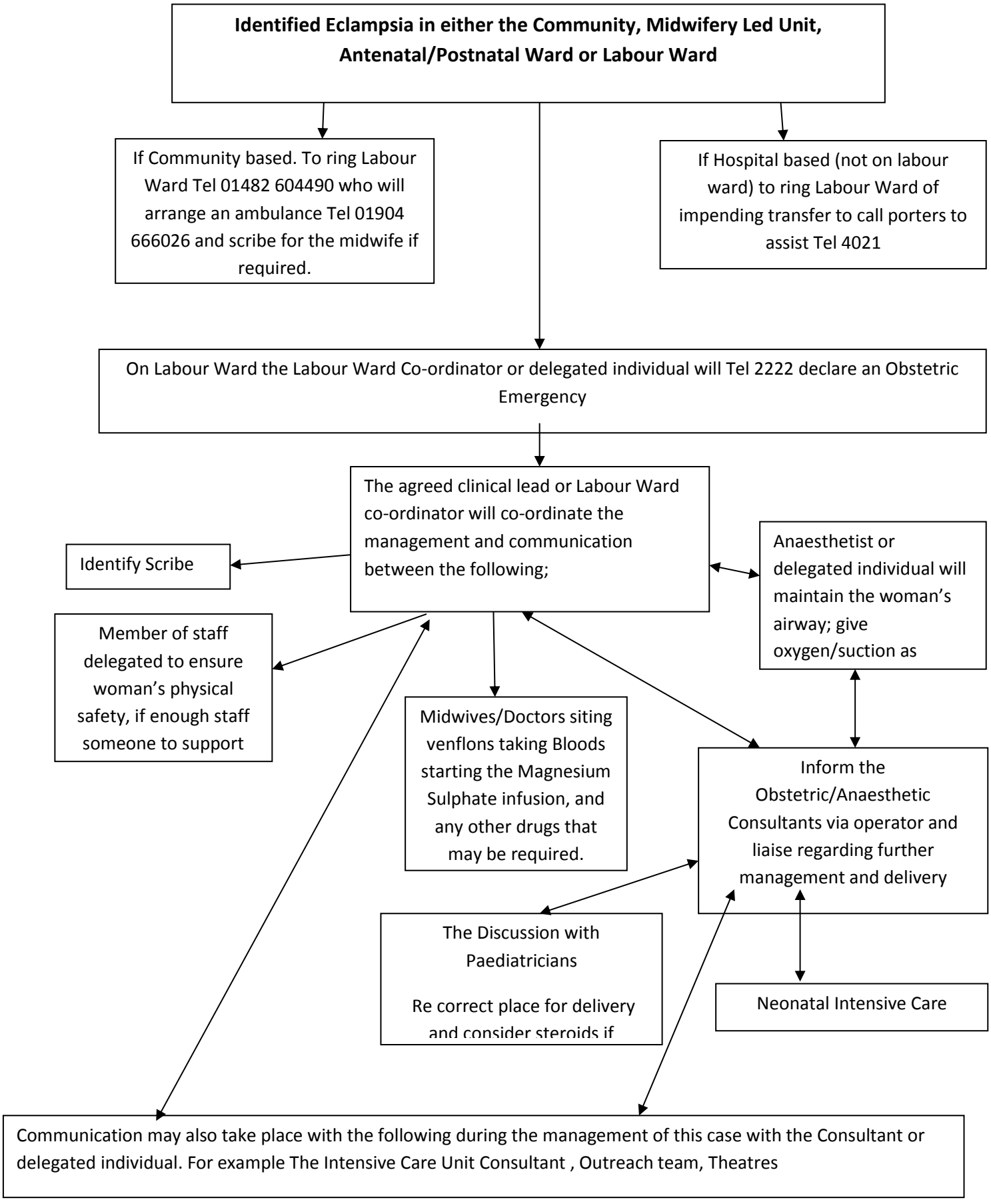
Regional blockage and fluids - Genuine pre-eclamptics tend to maintain their blood pressure, despite regional blockade. When this happens, fluid load is unnecessary and may complicate fluid balance. For this reason, fluid loading in pre-eclampsia should never be done prophylactically or routinely, and should always be considered and controlled. Vasopressors such as ephedrine, phenylephrine or metaraminol should not be given prophylactically. If hypotension does occur, a small dose of ephedrine is usually effective. In women with pre-eclampsia fluid requirements at caesarean section should be carefully considered and use of more than 500mls of fluid, unless to replace blood loss, should be exceptional.

Indications for central venous pressure monitoring a CVP may be indicated:

- if excessive blood loss occurs
- if oliguria fails to respond to the measures described above
- if the patient becomes hypotensive

APPENDIX 4

LINES OF COMMUNICATION



APPENDIX 5 **FLUID BALANCE**

If 2 x 4 hour blocks less than 80 mls each then there are two possible courses of action:

Action 1 – WHEN INPUT IS LESS GIVE Volpex 250MLS

If the total INPUT LESS than TOTAL (output +750mls) see Box 1 for example

- Px Volplex 250 mls. over 20 minutes.
- Watch output over 4 hours
- If less than 80 mls px 20 mgs I.V. furosemide
- If greater than 250 mls in 1 hour after the Frusemide, then give extra 250 mls Volplex of baseline fluids

OUTPUT				**BOX 1**					
Urinalysis									
Hourly urine	**5**	**28**	**14**	**10**	**15**	**20**	**12**	**4**	
4hrly rolling total				**57**				**51**	
TOTAL OUTPUT		**33**	**47**	**57**	**72**	**92**	**104**	**108**	**+750 = 858**
INPUT									
IVI(1) Hartmans Sol	**0**	**64**	**56**	**52**	**36**	**16**	**12**	**20**	
IVI(2) Mag Sulph	**30+7**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	
IVI(3) Labetolol	**2**	**4**	**12**	**16**	**32**	**32**	**16**	**8**	
CVP Line									
Oral									
Hourly Total	**79**	**80.5**	**80.5**	**80.5**	**80.5**	**80.5**	**80.5**	**80.5**	
TOTAL INPUT		**159.5**	**240**	**320.5**	**401**	**481.5**	**562**	**642.5**	**642.5**
DRUGS									
Labetolol Oral	**200+200**								
Labetolol IV	**50+50+50+50**								

Action 2 – WHEN INPUT IS GREATER GIVE IV FRUSEMIDE 20MGS

If the total INPUT GREATER than Total (OUTPUT + 750mls) see Box 2 for example

- Rx IV Frusemide 20mgs
- Watch output over the next 4 hours
- If greater than 250ml in 1 hour after the Frusemide then give extra 250mls of Volplex on top of the baseline fluids

OUTPUT				**BOX 2**					
Urinalysis									
Hourly urine	**18**	**21**	**12**	**19**	**6**	**8**	**24**	**10**	
4hrly rolling total				**70**				**48**	
TOTAL OUTPUT		**39**	**51**	**70**	**76**	**84**	**108**	**118**	**+750=868**
INPUT									
IVI(1)Hartmans Sol	**80**	**80**	**260**	**64**	**44**	**4**	**64**	**64**	
IVI(2) Mag Sulph	**30+7**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	
IVI(3) Labetolol	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	
CVP Line									
Oral	**200**	**150**			**20**	**40**			
Hourly Total	**359**	**246.5**	**80.5**	**80.5**	**80.5**	**80.5**	**80.5**	**80.5**	
TOTAL INPUT		**605.5**	**882**	**962.5**	**1043**	**1123.5**	**1204**	**1284.5**	**1284.5**
DRUGS									
Labetolol Oral	**200+200**								
Labetolol IV	**50+50+50+50**								

Failure to respond discuss with Consultant Obstetrician and Consultant Anaesthetist

Demographic Details

Date

Dear Dr……

Discharge from Community Midwifery Service to Primary Care

As per agreed pathway

Your above patient is now ……..days postnatal and was diagnosed with Pregnancy Induced Hypertension. The following observations were completed on

……

Relevant clinical background……..

……..

Blood Pressure……..

Medication at time of transfer……. ……

…….

Please provide an appointment for the above patient within the next four days from the date of this letter to review and plan subsequent care. This letter has been delivered in person by or on behalf of the above patient.

Yours sincerely

Community Midwife

01482 382658

NICE (2019) Clinical Guideline 107- Hypertension in Pregnancy
Guidance for GPs
FACTS

- Hypertension affects **6-10%** of pregnancies
- In **30-60%** of women who have hypertension during pregnancy, the blood pressure (BP) normalises by **3 days** postnatal and in **85%** of women BP normalises by **7 days** postnatally
- Approximately **0.3%** of women may develop hypertension postnatally
- Hull University Teaching Hospitals NHS Trust maternity audit demonstrated that 20-25 women were discharged every month to primary care on anti-hypertensive treatment
- Women will only be discharged from the maternity services to primary care if:-
    - Asymptomatic
    - BP 149/99mmHg or less (with or without treatment)
    - Blood results are stable or improving
- Suggested choice for first line anti-hypertensive treatment postnatally (safe for breastfeeding women) are
    - Labetalol - 100mg -600mg , 2- 3 times a day
    - Nifedipine SR - 10-20 mg twice daily
    - Enalapril - 5-20mg twice daily
- All women with persistent hypertension and/or proteinuria at 6 week postnatal should be referred for specialist assessment as per usual hypertension pathway in primary care

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Postnatal Management of Hypertension following Discharge from Women & Children Hospital IN Primary Care